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$$\frac{y^2}{d^2}(r+2n)^2 = x^2 + y^2, \quad (2).$$

Also, $n = \sqrt{(x^2 + y^2)} - r$, and substituting this value of n in (1) gives

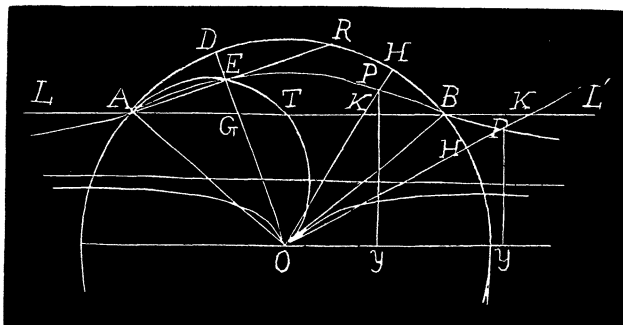
$$\frac{y^2}{d^2}[2\sqrt{(x^2 + y^2)} - r]^2 = x^2 + y^2, \quad (3),$$

which is the equation of the required locus.

For convenience of discussion, (3) may be put in form

$$y^2[2\sqrt{(x^2 + y^2)} - r - d][2\sqrt{(x^2 + y^2)} - r + d] = d^2 x^2, \quad (4).$$

It is evident that the curve has two branches which meet at $\pm \infty$ on the asymptote whose equation is $y = \frac{1}{2}d$. n is regarded as negative when *in* the circle, and positive when *outside* of the circle.



The ceroid may be used to trisect any angle. For if AOB is a given angle, and ATO a semi-circle on AO as diameter, and E is the point common to the circumference ATO and the ceroid, the angle AOE is one third of the angle AOB .

Proof. $DE = GE$, for E is on the ceroid.

The angle AEO is a right angle. Hence angle $DAE = \text{angle } GAE$. Then arc $AD = \text{arc } DR = \text{arc } RB$. Therefore the angle $AOD = \text{one third of the angle } AOB$.

NOTE ON THE POSTULATE THAT A PART IS EQUIVALENT TO THE WHOLE.

By DR. G. A. MILLER.

The quadratic equations considered in elementary algebra are generally written in one of the following two forms:

$$\begin{aligned} ax^2 + bx + c &= 0 \dots A, \\ ax^2 + 2bx + c &= 0 \dots B, \end{aligned}$$

where a, b, c are real numbers and a is supposed to differ from zero. An equation of form A is completely determined by the two ratios $b/a, c/a$. If these two ratios are regarded as the co-ordinates of a point and plotted in the ordinary way with respect to a Cartesian system, every finite point in the plane corresponds to a quadratic equation and every quadratic equation corresponds to such a point. The necessary and sufficient condition that two quadratic equations have different roots is that they correspond to different points. According to this well known interpretation the points of the plane are regarded as representatives of quadratic equations.

The condition that the two roots of an equation of form A are equal to each other is $\frac{b^2}{a^2} = 4\frac{a}{c}$. Representing $\frac{b}{a}$ by x and $\frac{a}{c}$ by y this condition becomes $x^2 = 4y$. Hence the points on the parabola whose equation is $x^2 = 4y$ represent the quadratic equations of form A whose roots are equal. The points within this parabola, *i. e.*, on the concave side of this curve, represent the quadratic equations whose roots are imaginary, while those on the outside of the parabola represent the equations whose roots are real and distinct. The fact which we desire to emphasize in this connection is that the totality of quadratic equations with real coefficients and imaginary roots can be put into a (1, 1) correspondence with the points within the parabola $x^2 = 4y$. In other words, the number of the points within this parabola is equivalent to the number of quadratic equations having real coefficients and imaginary roots.

If we suppose that all the equations under consideration are represented by form B , those which have equal roots will be represented by the points of the parabola $x^2 = y$. From this it follows that there is a (1, 1) correspondence between the totality of quadratic equations with real coefficients and imaginary roots, and the points within the parabola $x^2 = y$. As the number of the points within each of the two parabolas $x^2 = 4y$ and $x^2 = y$ is equivalent to the number of quadratic equations with real coefficients and imaginary roots, the two parabolas must contain the same number of points; *i. e.*, the number of points in one of these parabolas is equivalent to the number of points in the other. As the parabola $x^2 = 4y$ lies entirely within the one whose equation is $x^2 = y$ except where they touch each other, a part of the number of points contained in the parabola $x^2 = y$ is equivalent to the total number of these points.

While the above is only one of an indefinite number of illustrative examples of the reasonableness of the postulate that a part of an infinite number is equivalent to the whole, yet it seems to deserve special emphasis in view of its contact with very fundamental matters. Such illustrations seem desirable to prepare the way for the modern definitions of an infinite number; *viz.*, An infinite number is equivalent to a part of itself, or an infinite number remains unchanged if unity is added to it.